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Cotton, W.R., R.A. Pielke Sr.: Human Impacts on Weather and Climate. 2nd edition, Cambridge University Press, Cambridge (UK) 2007. 330 pp, 64 line diagrams, 20 halftones, 20 colour plates, £ 29.99, ISBN 978-0-521-60056-9, www.cambridge.org

This is a book of two eminent meteorologists, who write about climate. They write about atmospheric physics, about processes, in quite some detail, with very many references. Not much math, but quit a few sketches and diagrams. For anybody who wants an overview what processes, which issues, which paradigms and views prevail, this book is very useful. But it is not an easy read, not a book which can be read on the train from Bonn to Hamburg. Compared to the first version of the book, this 2nd edition is less good in telling a concept, in telling its "story"; instead it is providing lots of information, of details – without being a textbook useful for the class room.

The book is written in three "parts" and an epilogue.

Part I, "The rise and fall of the science of weather modification by cloud seeding" tells about a once fancy science, which had and still has its merits, but suffered from "overselling". In a sense, this part provides the morale of the whole book – overselling scientific knowledge and scientific potentials leads eventually to a crash; not the individual scientists, who are engaged in overselling, are paying for the short term success, but the community as a whole. Obviously, this example is meant an example, or analogy, of the present "global warming" debate, which the authors consider as overheated.

Part II, "Inadvertent human impacts on regional weather and climate" is dealing with the effects of urbanization and land-use/land-cover changes. Issues addressed are irrigation, deforestation and desertification. Atmospheric processes are dealt with in great detail, but the analysis of changing long-terms statistics are not really taken into account. Disappointing is that the authors have not really dealt with the historical perspective. The impact of deforestation is an issue which was dealt since the late 18th century (e.g., GROVE (1975), PFISTER and BRÄNDLI (1999), STEHR and VON STORCH (2000)). Such ideas are thus part of our (western) cultural fabric, and certainly also influence scientific thinking.

Part III, "Human impacts of global climate" deals with the modifications of the atmospheric radiation budget due to changing concentrations of carbon dioxide, water vapor, aerosols and dust. The nuclear winter hypothesis is discussed; the knowledge about global effects of changing land surface conditions is reviewed. Again, the problem is looked at from the viewpoint of processes, while the angle of empirical evidence based on long term statistics is almost entirely disregarded. No mentioning is made of the concept of "detection" of non-natural climate change and "attribution" of most likely causes. The short subsection on the IPCC is much too short; hidden in this section is a definition of what the authors consider to be a "prediction" – their definition includes projections and scenarios, so that the two words "forecast" and "predictions" are very different terms.

In the epilogue, the authors leave their "scientific sector of competence" but discuss general societal issue of the process of science in a politically driven society. This is a thoughtful and interesting part of the book, a good read. In particular the chapter "Scientific credibility and advocacy" is interesting, albeit very short – a much deeper discussion "The honest broker" has been published by the son of the second author, Roger Pielke Jr. in 2007.

However, in the subsection "The dangers of overselling" the authors become inconsistent with their own definition of "predictions" – they claim that contemporary models are "not capable of predicting climate" – thus no realistic scenarios possible? – and they can not be included "in quantitative forecast systems" – who is claiming the latter? Certainly, such models are capable of making "credible predictions of long term climate trends and regional impacts", when the word "predictions" is understood as scenarios, i.e., "descriptions of plausible, possible, internally consistent but not necessarily probable futures". They are not capable of making credible forecasts (meaning specifying most probable states at some future time), right.

In summary – this book constitutes a good contribution to the present debate about humans' influence on climate; it brings in many different and valid view points. Bill Cotton and Roger Pielke Sr. widen the horizon of understanding and options, which we see limited by those who are zealous to use scientific knowledge in shaping culturally preferred policies, who prune scientific knowledge claims according to their political utility.

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H. VON STORCH, Geesthacht

Murray, P: Klima im Wandel – Erde in Gefahr. Spektrum Akademischer Verlag in Elsevier, 2007. 176 S., 113 farb. Abb., 6 schw.-w. Tab. – 31,00 x 27,00 cm gebunden, €[D] 24,95, €[A] 25,70, SFr 39,00, ISBN: 978-3-8274-1929-3, www.springer.com

Der Report des Beraters der britischen Regierung, Sir Nicolas Stern, im Herbst 2006 und der vierte Sachstandsbericht des Weltklimarates (IPCC) haben das Thema Klimawandel und die dadurch zu erwartenden globalen Änderungen in den Lebensbedingungen auf unserer Erde endlich in die breite Öffentlichkeit gebracht. Diese Entwicklung muss den Spektrum Akademischer Verlag bewogen haben, dieses populärwissenschaftliche Bilderbuch nur drei Monate nach dem Erscheinen der Originalversion "Our Earth – Global Warming, the Evidence" bei Murray Books in Australien in einer deutschen Übersetzung auch bei uns herauszubringen.

Das Buch spricht den Leser im Wesentlichen durch die großformatigen, teilweise doppelseitigen Farbphotos an. Auf den ersten 52 Seiten sind zwischen den Bildern einige allgemeinverständliche Texte zu finden, die die Botschaft des Buches verdeutlichen sollen. Grundlegende Fakten zum Klimawandel und zum Ozonloch werden vorgestellt und erwartete Auswirkungen der globalen Veränderungen werden beschrieben. Auf drei Seiten wird aus dem Stern-Report zitiert und zuletzt werden Empfehlungen an den Leser gegeben, was er in seinem eigenen Umfeld tun kann. Diese Empfehlungen beziehen sich vor allem auf Strom- und Wassersparen und eine ökologische Gartengestaltung. Die Themen scheinen noch auf australische Verhältnisse abgestimmt zu sein und wirken mittlerweile etwas veraltet. Das Thema Heizung, Warmwasserbereitung und Wärmedämmung von Gebäuden kommt genauso wenig vor wie der in hohem Maße fossile Rohstoffe verbrauchende Individualverkehr oder die Verwendung erneuerbarer Energien. Befremdlich ist auch die Empfehlung, im Garten Pflanzen zu verwenden, die von Insekten gemieden werden. Hier ist vielleicht aber auch nur unzureichend ins Deutsche übersetzt worden.

Die Texte sprechen neben dem Thema Klimawandel auch das Ozonloch an. Dabei fällt auf, dass die Texte teilweise beziehungslos hintereinander stehen. Eine thematische Gliederung ist kaum zu erkennen. Zwischen den Problemkreisen Erwärmung und Ozonloch wird keine inhaltliche Verbindung geschaffen. Nachdem das Thema Ozonloch schon auf den Seiten 20 und 24 vorgestellt worden war, wird es auf den Seiten 48/49 unerwartet noch einmal aufgegriffen, einige Inhalte und ein Bild werden dabei sogar wiederholt.

Ähnlich unorganisiert ist die Auswahl und Reihenfolge der Farbbilder, die den Hauptteil des Buches ausmachen. Folgen der globalen Erwärmung sind gemischt mit Bildern, die sich auf das Ozonloch beziehen. Dazwischen finden sich gelegentlich Bilder, die Smogsituationen in Megacities vorstellen. Es lässt sich weder eine thematische noch eine geographische Gliederung erkennen. Ganz fehl am Platz sind einige Aufnahmen, die sich auf die große Tsunami-Katastrophe Ende 2004 beziehen. Eine ursächliche Beziehung zwischen dieser geophysikalischen Katastrophe und dem Wirken der Menschheit ist nicht bekannt, und nach heutigem Wissen auch kaum vorstellbar. Endgültig Bild-Zeitungsniveau hat die Aufnahme auf der Doppelseite 128/129, die eine spärlich bekleidete junge Frau zeigt, die in einem geöffneten Kühlschrank sitzt, um (wörtliches Zitat) "ihren von der Arbeit in einem öffentlichen Freibad ... erhitzten Körper auf erträgliche Temperaturen zu bringen". Zudem steht dieses Bild in eklatantem Widerspruch zu den im ersten Teil des Buches gegebenen Energiespartipps.

Vom Spektrum Akademischer Verlag war man bisher wesentlich solidere und fachlich korrekte Publikationen gewohnt. Vielleicht trägt der häufigere Eigentümerwechsel bei diesem Verlag zu dieser bedauerlichen Entwicklung bei. Seit dem 1. 8. 2007 gehört Spektrum Akademischer Verlag zu Springer Science+Business Media (Springer). Als das Buch gedruckt wurde, war noch Elsevier der Eigentümer, der Spektrum Akademischer Verlag auch erst im Januar 2003 übernommen hatte.

Das Buch kann somit leider kaum empfohlen werden. Selbst wenn man den angesprochenen Leserkreis noch unter dem populärwissenschaftlichen Niveau ansetzen will, sollte man zumindest die Texte in eine logische Reihenfolge bringen und sie aufeinander abstimmen. Genauso sollte man die Bilder zumindest ordnen. Offensichtlich ist das vorliegende Werk überhaupt nicht lektoriert worden und soll lediglich einem kurzfristigen kommerziellen Erfolg dienen. Selbst der relativ geringe Verkaufspreis sollte nicht dazu verführen, sein Bücherregal mit dem großformatigen, fast zwei Kilo schweren Buch zu belasten. Wenn man es doch haben möchte, so sollte man noch etwas warten. Man wird es vermutlich in kurzer Zeit in einem modernen Antiquariat zu einem Bruchteil des heutigen Verkaufspreises erhalten können.

S. EMEIS, Weilheim

Vallis, G.K.: Atmospheric and Oceanic Fluid Dynamics – Fundamentals and Large-Scale Circulations. Cambridge University Press, Cambridge (UK), 2006. XXV + 745 pp. H/B £ 40.00, ISBN 978-0-521-84969-2, www.cambridge.org

I admit, I haven't read all the 16 chapters of this wonderfully designed textbook on "Atmospheric and Oceanic Fluid Dynamics". On 745 pages, the author introduces us into the fundamentals and large-scale circulations of the atmosphere and oceans. The 717 pages of text are divided into four parts with 245, 204, 132, and 136 pages, respectively. In the first part "Fundamentals of Geophysical Fluid Dynamics", the *Equations of Motion*, the *Effects of Rotation and Stratification*, the *Shallow Water Systems and Isentropic Coordinates*, *Vorticity and Potential Vorticity*, and *Simplified Equations for Ocean and Atmosphere* are discussed. The second part "Instabilities, Wave-Mean Flow Interaction and Turbulence" contains the chapters *Barotropic and Baroclinic Instability, Wave-Mean Flow Interaction, Basic Theory of Incompressible Turbulence, Geostrophic Turbulence and Baroclinic Eddies, and Turbulent Diffusion* and *Eddy Transport*. The remaining two parts "Large-Scale Atmospheric Circulation" and "Large-Scale Oceanic Circulation" comprise 3 chapters each. In the atmospheric part, the overturning circulations (Hadley, Ferrel Cells), the mid-latitude circulations and planetary waves and the stratosphere are discussed. The oceanic part considers the wind-driven gyres and the wind- and buoyancy-driven circulations in the ocean.

As a text book, I used G. K. Vallis' textbook in the last year mainly for refreshing my knowledge about the fundamentals of dynamics. I think, it is one of the strengths of the book to provide a clear and consistent view from the fundamentals to the current research topics. Moreover, I also found the book extremely helpful to introduce the issues of fluid dynamics to students. Fortunately, a young student of mathematics writing her diploma thesis at our institute started in early spring last year. She had no background in meteorology or in fluid dynamics. And, as I was partly involved in supervising her, I tested the textbook of G. K. Vallis to teach her the basics of atmospheric circulations.

We started with the shallow water equations and enjoyed the clarity and the comprehensiveness of the text. For the student, the text was an excellent starting point into the atmospheric dynamics. Simultaneously to the reading and discussions about this topic, we used the analytic solutions presented for the non-rotating/rotating flows to verify her attempts solving the shallow-water equations numerically. Gravity wave propagation and dispersion relationships followed almost automatically. In this way, we had an easy and clear way to proceed with the tasks she had to solve in her diploma work. Another example was a dispute we had after a PhD student gave a talk and used some basic relationships written for isentropic coordinates. A scientist questioning these findings was easily convinced after we showed him the respective pages in G. K. Vallis' textbook.

Since this time, I consulted the book many times and found its presentation exceptionally clear and concise. There are appendices at the end of each chapter containing notes and hints for further reading and problems. I consider this as an excellent way to stimulate further thinking about the fundamentals and to deepen and broaden the knowledge.

Scanning through the references, I got the impression that all essential classical and recent articles which contributed to the theoretical geophysical fluid dynamics are contained. German contributions (except the numerous quotations of our "Klassiker" in this field, namely of Ertel and Stommel) are, however, rare. I do not comment this as it can be viewed from at least two sides. Nevertheless, I was proud to found two citations of two of our senior scientists and two more recent papers from a former PhD student who continues his career in North America.

Nevertheless, I would be happy to see this wonderful textbook on as many desks of our community as possible.

A. DÖRNBRACK, Oberpfaffenhofen

Van den Dool, H.: Empirical Methods in Short-Term Climate Prediction. Oxford University Press, Oxford, 2007. 215 pp. H/C £ 49.95, ISBN: 978-0-19-920278-2, www.oup.com

Depending on your profession and interests, knowledge about next season's climate might be more important (or at least as important) to you than tomorrow's weather. Short-term (i.e. mainly seasonal) climate forecasts are useful for agriculture, energy supply planning and water management and are provided operationally by several institutions, NOAA's Climate Prediction Center (CPC), which is the author's affiliation, being among the pioneering ones. The availability of global reanalyses covering half a century, together with powerful methods for statistical data analysis has stimulated progress in this fascinating field. In spite (or because, as the author argues) of all the ongoing actvities it seems that up to now, information about methods and results in climate prediction is scattered throughout the literature and there is no monograph treating the topic. Dr. van den Dool, a long-term practitioner in this area, has used his teaching and presentation materials to produce such a monograph with a strong inclination towards the practical aspects of seasonal climate prediction. As the title indicates and for reasons discussed especially in the final chapter of

the book, the emphasis is on statistical-empirical methods using observations and reanalysis data rather than on methods using numerical models (although numerical models sneak in through the back door via the reanalyses which are the basis for most of the statistical analyses mentioned in the text).

The book is addressed at graduate students, interested researchers and practitioners. It is a quick and no-frills introduction using (dynamic) meteorology, statistics and some mathematics, especially matrix algebra, whenever needed. Appropriately enough, the foreword to this book on prediction is written by Edward N. Lorenz (who had also worked in the field for some time). The book consists of 10 chapters, a list of acronyms and notions, a list of symbols (both of which are very helpful) and an exhaustive list of references. Besides the introduction and the final chapter, the book has two main parts: chapters 2 to 7 provide a quick introduction to various methods and ideas relating to short-term climate prediction, whereas the following chapters describe their application to (chapter 8) and the practice of (chapter 9) short-term climate prediction. Some important technical points are discussed in appendices. After an overview in chapter 1, chapter 2 introduces some ideas used throughout the book like orthogonal functions, covariance and how to calculate anomalies. Chapter 3 deals with Empirical Wave Propagation, a method co-developed by the author which he describes as an "attempt to measure Lagrangian persistence", i.e. the persistence of advected features. Not really being a practical forecast method, its main reason for appearing in the book is its use for "rock in the pond" experiments to study the propagation of disturbances, useful for predictions and targeted observations. Although quite short, chapter 4 on teleconnections is basic to climate prediction, since it discusses the relation between predictable and long-lived causes (sea surface temperature, soil moisture) and seasonal climate effects. The North Atlantic Oscillation (NAO) and the Pacific North-American Pattern (PNA) are discussed as the most famous teleconnections in the Northern Hemisphere. ENSO is briefly introduced, the main discussion of its application to climate prediction being deferred to chapter 8. A method to find teleconnections systematically, namely EOT (empirical orthogonal teleconnections) is described. A comparatively long chapter is devoted to the nowadays omnipresent empirical orthogonal functions (EOFs). Besides the basic concepts, issues like orthogonality in space vs. time, explained variance in terms of eigenvalues, simplification and interpretation of EOFs are discussed, including a detailed example. The link to forecasting is made through EOT. Independent of the context of the book, this chapter could also serve as a quick introduction to EOFs in itself. Another important concept is discussed in chapter 6, namely the "effective degrees of freedom" which deals with the question of how much independent (uncorrelated) information is contained in gridded atmospheric data. Different heuristic formulas based on correlations and EOFs are presented and shown to give comparable results. Being much relied upon in later chapters of the book (and being interesting in itself), this concept should have been treated in more detail. An obvious method to make climate predictions is described in chapter 7: the method of analogues, which is based on the idea of finding patterns in the past similar to the present one and to assume that the present pattern will develop in a similar manner as the known past one for a short time span at least. It is shown, however, that this method of natural analogues does not work well due to the lack of analogues which deserve that name. Therefore the method of constructed analogues, to which the author also made significant contributions, is introduced. The idea here is to linearly combine past patterns to approximate the pattern at hand and to make forecasts using the linear weights. The method is shown to work well for processes which are approximately linear, e.g. sea surface temperature forecasts. Chapter 8 discusses various forecast methods from climatology over persistence and regression to numerical methods using the concepts introduced in earlier chapters. The question of climate normals, important in a changing climate, is addressed as well as the issue of consolidation, i.e. how to combine the different methods to produce an optimal forecast. Finally, other methods and methods not recommended are briefly discussed. Chapter 9 deals with practical and operational issues of forecasts like lead time, layout, time scales and quantities to forecast. Much space, including examples, is devoted on how to convey the probabilistic forecast information to the public. Problems of verification and accounting for climatic trends are also addressed. Chapter 10 is about more fundamental topics like linearity, performance of general circulation models (GCMs) vs. empirical methods and predictability; it closes with an outlook on the future of climate prediction, especially in view of the generally low skill of climate predictions. Again using degrees of freedom, the author gives an interesting line of reasoning concerning the performance of GCMs vs. the empirical methods described in the book. He argues that "... some aspects of the behaviour of the atmosphere are perhaps much more linear than expected ...". This makes the linear methods presented in the book work and outperform the numerical models, since the GCM's nonlinearity produces spurious noise which can only be removed by large ensembles. Although not elaborated in detail, this is certainly an original contribution to the controversial discussion of this issue.

The book is written in a lively, frank and inspired style and the vast experience of the author shows through on many occasions. The chapters on methods

provide quick introductions which can be read for themselves, but still the interconnections and the relation to climate prediction are always pointed out. One can see that they are written by a practitioner who knows the advantages and pitfalls of the methods he describes. A few things could be improved in the book, for example the uneven length and character of the chapters. Sometimes a possibly less relevant method is treated at length (e.g. EWP), whereas other concepts (e.g. degrees of freedom and important methods collected in section 8.7 like canonical correlation analysis) are treated rather briefly. Similarly, the use of numerical models in climate prediction, work outside CPC, a discussion of which regions lend themselves particularly to climate prediction and how climate trends are accounted for, could have been presented in more detail. The book could have done with some more careful editing; to give just two examples: figure 5.6 seems to be taken directly from a presentation with some arrows lost, and on page 154 we find strange summations.

For those who look for a quick introduction into the topic or for a starting point for their own work, including suggestions of research topics, this book can be recommended. Further study is aided by the extensive and up-to-date reference list and the references to websites containing more details and actual predictions. Dr. van den Dool has certainly succeeded in following the motto quoted in the preface of his book: "... Second, there is the knowledge that comes naturally by instinct or intuition, by ideas that come, seemingly, out of nowhere. It is the second kind of knowledge that I hope to impart to the reader of this book."

G. SCHÄDLER, Karlsruhe

Zdunkowski, W., T. Trautmann, A. Bott: Radiation in the Atmosphere. Cambridge Univ. Press, Cambridge (UK), 2007. 496 pp., 69 line diagrams, 42 half-tones, 99 exercises. H/B £ 75.00, ISBN 978-0-521-87107-5, www.cambridge.org

"Radiation in the Atmosphere" is a new book giving a broad and precise overview of solar and thermal radiative transfer in the Earth's atmosphere. The book includes not only the pure radiative transfer theory but also explains the underlying physics, in particular, the absorption, emission, and scattering of radiation, as well as some applications. As such, it basically provides everything a student needs to know about radiative transfer theory. The subtitle is "A course in Theoretical Meteorology" and this is what it is: a sound theoretical introduction into the subject of radiative transfer.

The book starts with the definition of radiation quantities and introduces the special conditions of the Earth's atmosphere, including the sun as the source of energy, the variability of the extraterrestrial irradiance, and the radiation budget of the Earth. The radiative transfer equation is derived in the second chapter. Chapter 3 discusses principles of invariance such as in Chandrasekhar's "Radiative Transfer". Chapter 4 explains the most relevant quasi-exact solutions of the radiative transfer equation, covering all state-of-the-art methods including the matrix operator method, successive orders of scattering, discrete ordinate, spherical harmonics, finite difference, and the Monte Carlo method. Especially for the last technique, a reference to the standard literature would have been useful, in particular to the new book by Marshak and Davis, "3D Radiative Transfer in Cloudy Atmospheres". Chapter 5 gives quite a detailed overview of radiative perturbation theory, followed by a chapter about the two-stream method and its applications. The following three chapters cover the interaction of radiation with atmospheric constituents, in particular, molecular absorption as well as scattering by molecules and spherical droplets. Chapter 10 introduces polarization and the vector radiative transfer equation. Finally, the last two chapters cover remote sensing and the influence of clouds on the Earth's climate which are probably the most important applications of radiative transfer theory at present. Each chapter ends with a number of exercises. Brief answers to the exercises are given at the end of the book.

"Radiation in the Atmosphere" is not the first book about radiative transfer theory, and therefore one of course has to ask if we really need another one. After reading the book, the answer is a clear "yes" in my opinion. One of the first impressions when opening the book is the large number of equations, as the authors precisely derive every equation in a depth which is not covered by most other radiative transfer books. The student is never left alone with formulations like "as can easily be shown" etc. Instead, great care is taken in providing a mathematically correct and complete formalism which should also be appreciated by lecturers who use the book as a basis for their radiative transfer lecture. Another strength of this book is that it covers not only basic radiative transfer theory but also the underlying single scattering theory as well as the most important applications. As such, "Radiation in the Atmosphere" can probably replace three books: One about pure radiative transfer theory (like Chandrasekhar's "Radiative Transfer"), one about single scattering theory (like Bohren and Huffman's "Absorption and Scattering of Light by Small Particles") and one about applications (remote sensing, clouds and climate).

In summary, the book gives a precise overview about radiative transfer theory and related subjects. While the mathematical description is exhaustive, at places a few simple sketches or explanations would help the student to better understand the subject: e.g. the successive orders of scattering method is very simple to understand if

expressed in words and explained with a sketch, while the book provides only the formulas in this case. Also, for a real-life application of radiative transfer somewhat more guidance would be helpful which method should be used for which purpose and what are the uncertainties and computational speed. Eight different numerical methods to solve the radiative transfer equation are introduced in chapters 4 to 6, but the reader is basically left alone with the decision what to use for a particular purpose. Also, the quite lengthy introduction of the perturbation theory would be more useful if a real example of its application would have been provided. Instead, the authors present the consideration of a Lambertian surface albedo with perturbation theory which takes three pages and ends with the well-known geometrical series result which can be directly derived in a couple of lines. Anyway, the intention of the book is to give a good introduction into the theory and this aim is completely met. I highly recommend this book to any lecturer who wants to give a precise overview of the subject, and if supplemented with some "feeling" for which methods are relevant for which purpose, the book will be an ideal basis for a radiative transfer lecture. As outlined above, the book does not serve as a quick overview for students who just want to use one of the freely available radiative transfer codes, but more as a detailed introduction for those who want to develop their own code.

At the end of the preface, the authors state that "no book as technical as this one can be free of errors". This is certainly true but I have to admit that I did not find any substantial error. In line with the authors, each of whom "takes comfort in the thought that any errors appearing in this book are due to one of the other two", I take comfort in the thought that somebody else will discover them and leave it as a simple excercise to the students to find them!

B. MAYER, Oberpfaffenhofen